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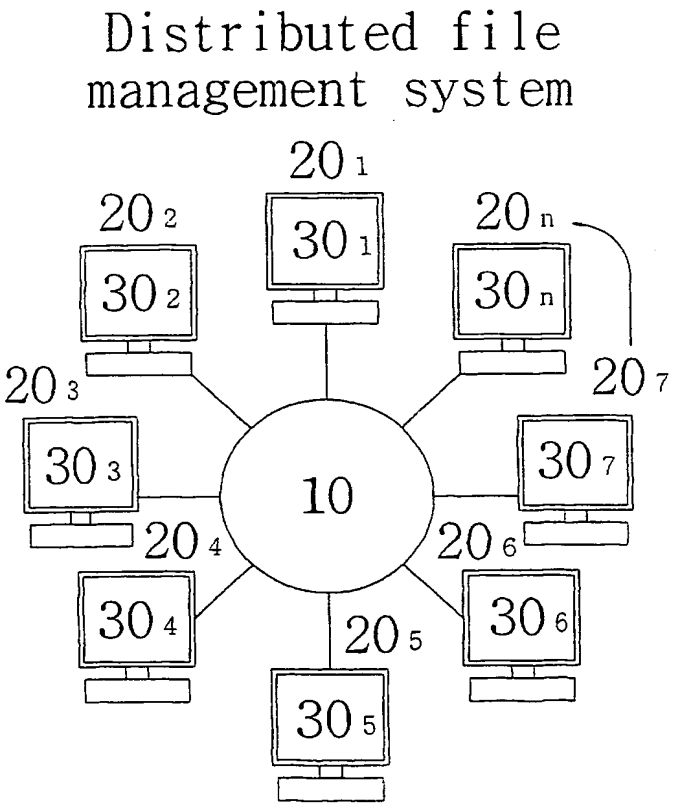
(54) Title: METHOD OF TRANSFERRING A DIVIDED FILE



(57) Abstract: Disclosed is a method for receiving files divided from a single file by a plurality of servers under a network environment. The method according to the invention includes the steps of selecting a desired file to be received by a user's device, receiving information on the devices storing the file from a file management system that manages transmission of files, determining one or more servers, through which the file is to be transmitted, among the devices storing the file, requesting one or more servers to transmit a part of the file, respectively, receiving the requested parts of the file from one or more servers, respectively, and integrating the parts of the transmitted file into a single file. The file management system is a system managing transmission of files, and may exist as a separate file management server or split into a plurality of devices. According to the invention, a transmitting velocity is enhanced by receiving a plurality of files divided into a number of servers. When any problem occurs in one of the servers during transmission of a file, another server is substituted for submission of the file with fault tolerance of a server.

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A METHOD OF COLLABORATING IN TRANSFERRING A FILE IN A NETWORKING ENVIRONMENT

Technical Field

The present invention relates to a method for collaborating in transferring a file in a network environment, and more particulary, to a method for receiving files divided from a single file by a plurality of servers under a network environment.

Background Art

In the prior art client/server model under a network environment, a one-to-one transmission method is employed, in which a client connects to a server and receives a file. In this method, if the transfer rate of the server is low, the client receives a file at a low rate in the condition that it cannot make the best use of its bandwidth. If the number of internet users is increased during transmission, transfer rate is drastically decreased even if the client connected to the most appropriate server. In addition, if there occurs an error to the server transmitting a file, the file transmission ends in a failure. Thus, there occurs a problem that the client must receive a file again from another server.

U.S. Patent No. 6,085,251 discloses a method for transmitting files in parallel in order to enhance a file transfer rate. In this method, a server separates a single file into a plurality of packets, simultaneously transmitting these packets in parallel to a client, and receiving an acknowledgement signal from the client. The server informs the client of the fact of file separation, and then the separated packets are integrated at the client. This method offers much higher file transfer rate as compared to transferring packets one by one and verifying correct delivery of each packet sent. However, if there is an error to the server, file transfer is made impossible, thus not ensuring a stable file

transfer.

Since the one-to-one transmission method has such a disadvantage, and a personal computer can serve as a server with the improvement in performance of the personal computer, there is no need to keep to the one-to-one transmission method.

Disclosure of Invention

It is, therefore, an object of the present invention to enhance a transfer rate by allowing users to make the best use of their bandwidth by receiving a plurality of files divided from a single file by a number of servers.

It is another object of the present invention to provide a fault-tolerant system by replacing a failing server by another server immediately in the event that any anomaly occurs in one of a plurality of servers during transmission of a file.

It is another object of the present invention to provide a method for ensuring transfer of fragments of the same file from a plurality of servers as a precondition for receiving a single file divided into a plurality of fragments by a plurality of servers.

It is another object of the present invention to provide a method for splitting a file and storing it into a plurality of devices if the entire file cannot be stored in a single device, and viewing the entire contents of the file by the file transfer method in accordance with the present invention.

To achieve the above object, there is provided a method for transferring a file among a plurality of devices connected via a network in accordance with a first aspect of the present invention, including the steps of: selecting a desired file to be received by a user device; receiving information on the devices storing the file from a file management system that manages transmission of files; determining one or more servers, through which the file is to be transmitted, among the devices storing the file;

requesting one or more servers to transmit a fragment of the file, respectively; receiving the requested fragments of the file from the one or more server, respectively; and integrating the fragments of the transmitted file into a single file.

Here, the server means a device acting as a server, i.e., a device for transferring a file, said transfer includes streaming as well as downloading.

To receive a file from a plurality of servers, there must be a system managing transmission of files. This file management system may exist as a separate file management server or split into a plurality of devices.

When the user device determines one or more servers to transfer a file, it is preferable that they are determined in order of transfer rate. In addition, when receiving each fragment of the file from a plurality of servers, it is preferable that a large quantity is received from a server having a high transfer rate, and a small quantity is received from a server having a low transfer rate.

After the user device has received each fragment of the file from the plurality of server, it records this information on a log file. This log file is used for integrating fragments of the file into the original file later.

Each time the user device receives packets of a certain size from each of the servers, it evaluates the transfer rate of the server. If the transfer rate is sharply decreased, or there is an unstable server, another server substitutes for this server.

The substitute server is determined from a list of devices storing the file received from the file management system, or is determined from the list updated by the file management system by request.

Meanwhile, in order to receive files divided from a single file by a plurality of server, it must be assured that all the servers transfer fragments of the same file. In the present invention, at the time of file transfer, the information of the original file is

recorded on a metafile, and upon transferring fragments of the file to another user, a file to be transferred is compared with the information stored in the metafile.

In accordance with the first aspect of the present invention, users can make the best use of their bandwidth by receiving files divided from a single file by a plurality of servers, for thereby enhancing a transfer rate. When any anomaly occurs in one of the servers during transmission of a file, the file can be transmitted with fault-tolerance of the server by replacing the failing server by another server immediately.

The present invention can be used also in the case that a file is substantially split and stored into a plurality of server, as well as in the case that files from the plurality of servers are integrated and received.

That is, in the case that a file is split and stored into a plurality of devices connected via a network, there is provided a method for calling the file in accordance with a second aspect of the present invention, comprises the steps of: receiving information on devices storing each fragment of the file from a file management system managing file transfer; determining one or more server to transfer each fragment of the file from the devices storing each fragment of the file; receiving each fragment of the file from the determined one or more server; and integrating each fragment of the file into the file.

In addition, there is provided a method for transferring a file from one device to a plurality of devices among devices connected via a network in accordance with a third aspect of the present invention, comprising the steps in which: the one device transfers the file to the fastest device of the plurality of devices; and the file is transferred down to the slowest device in such a manner that the fastest device having received the file transfers the file to the secondly fast device of the plurality of devices, and the secondly fast device having received the file transfers the file to the thirdly fast device, and in

which if the one device finishes file transfer to one of the plurality of devices, the file is transferred to another device of the plurality of devices.

In addition, there is provided a method for transferring a file from one device to a plurality of devices among devices connected via a network in accordance with a fourth aspect of the present invention, comprising the steps in which: the one device transfers the file to the plurality of devices; and if the amount of transmission exceeds a predetermined level, the one device transfers the file only to the fastest device of the plurality of devices, the fastest device receiving the file from the one device, simultaneously transferring the file to other devices of the plurality of devices.

In accordance with the third and fourth aspects of the present invention, a file can be transferred from one device to a plurality of devices at a high rate.

Brief Description of Drawings

The above objects, features and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a view of the overall construction of a file transfer system in accordance with the present invention;

Figs. 2 through 4 are views of the construction of a file management system in accordance with the present invention;

Fig. 5 is a flow chart schematically illustrating a file transfer process in accordance with the present invention;

Fig. 6 is a view of the data structure of a list of candidate servers storing information of servers capable of transferring a file;

Fig. 7 is an exemplary view of a log file recording file transfer information;

Fig. 8 is a view illustrating the phase of transferring a file in accordance with the present invention;

Fig. 9 is a view illustrating the phase of transferring a file from one device to a plurality of servers in accordance with the present invention.

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Best Mode for Carrying Out the Invention

A preferred embodiment of the present invention will now be described with reference to the accompanying drawings.

Fig. 1 is a view of the overall construction of a file management system in
10 accordance with the present invention.

As illustrated in Fig. 1, the file transfer system of the present invention includes a plurality of devices 20_1, 20_2, 20_3, .. 20_n connected via a network 10.

The network 10 includes all networking-enabled environments, such as a wire internet using a modem, PSTN, leased-line, ISDN, etc., wireless internet using a PCS,
15 microwaves, a satellite communication network, etc., intranet, extranet, and so on. The devices 20_1, 20_2, 20_3, .. 20_n may be all devices available for data communication, such as a PC, workstation, minicomputer, mainframe computer, notebook computer, general portable communication terminal, PDA (personal digital assistant), set top box, digital television, web phone, etc.

20 The devices 20_1, 20_2, 20_3, .. 20_n can receive a file from other devices connected to the network 10, and can transfer the file to other devices. For this purpose, there exist a file management system 30 for managing the location of each device, file information, etc.

The file management system carries out the functions of giving a specific file
25 ID to the file commonly shared between a plurality of devices, and managing a list of

files which can be transmitted between the devices, so that one device can receive the segmented files from the plurality of devices. The file management system can be one of the pluralities of devices as shown in Fig. 1, and it can consist of the plurality of devices in collaboration with one another.

Various types of the file management system are illustrated in Figs. 2 through 4. Fig. 2 illustrates a central control file management system 30, the file management system being implemented in a large-scale device, such as a server. In this case, the file management server manages all information needed for file transfers, and controls file transfers between devices in an overall way.

Fig. 3 illustrates a distributed file management system 30, in which the file management system is split into a plurality of devices. In this case, the information required for collaborating in transferring a file is split and stored into the plurality of devices, and the control of file transfer is performed in collaboration between the plurality of devices.

Fig. 4 illustrates a hybrid file management system 30, i.e., a combination of the systems in Figs. 2 and 3. In this case, although the management of the information required for file transfers and the control of file transfers are performed mainly by the file management system 30, the rest of the devices performs parts of the task in collaboration.

Figs. 2 through 4 are nothing but an example of the file management system, and the file management system can be implemented by way of various topologies.

Fig. 5 is a flow chart explaining the process of transferring a file in accordance with the present invention.

First, a user device 20 wanting to receive a file receives a list of receivable files from the file management system in S501, and designates a desired file to be received

and informs the file management system of it in S502.

The file management system checks devices storing the file designated by the user device 20, calculates the location and transfer rate of each device, and transfers it to the user device 20 by alignment of the devices in order of transfer rate in S503. One example of such a list of devices (hereinafter, referred to as "a list of candidate servers", said "server" meaning a device acting as a server) is illustrated in Fig. 6. As illustrated in Fig. 6, the list of candidate servers includes a server ID 601, server location 602, server transfer rate 603 by each server, and is aligned in order of server transfer rate. The server transfer rate 603 is calculated in consideration of the bandwidth and the number of tasks currently being executed.

The user device 20 receives the list of candidate servers, and determines the servers suitable for file transfers from the list in S504. In other words, the user device 20 designates an n-number of servers 40 in order of transfer rate in order to make the best use of its bandwidth, which will be represented by the following expression.

$$BW \cong v_1 + v_2 + \Lambda + v_n (v_i \geq v_{i+1})$$

BW: user bandwidth

V_i : rate of i-th device

As shown in the above expression, so that the user device 20 can make the best use of its bandwidth, the sum of the transfer rate of the servers 40 must be a value close to the bandwidth. So as to fully use the bandwidth, the sum of the transfer rate of the servers 40 must be a value larger or smaller than the bandwidth. For example, in an environment of a low transfer rate, such as a modem user's environment, it is proper to

designate one server 40 having the highest transfer rate.

After the user device 20 has determined an n-number of servers 40 having a high transfer rate, it determines what part of a file of what size to receive from the determined servers 40 in S504. In this case, it is preferable that a larger amount of the file is received from the server having a high transfer rate 40, while a smaller amount of the file is received from the server 40 having a relatively low transfer rate, which will be represented by the following expression.

$$f_i = F \frac{v_i}{\sum_{j=1}^{n} v_j}$$

fi: size of fragments of file allocated to i-th device

F: size of file to be received

The list of transmission servers 40 determined in S504 and the information on fragments of a file to be transmitted by each server 40 are recorded on a log file. This log file is required for the user device 20 in receiving fragments of a file from a plurality of servers 40 and integrating them into the file.

Next, the user device 20 informs a transmission server 40 of the information on fragments of a file to be transmitted, and requests a file transfer in S505.

The user device 20 receives the fragments of the file, and records the transmitted information on the log file. In this process, another server 40 substitutes the server 40 having a problem in transferring a file for transmission, and the transmission of the file will be explained in detail later. In addition, the fragments of the file transmitted from the plurality of servers must be the fragments of the same file, and the

method for ensuring the identity of the file will be explained later.

When the transfer of the fragments of the file from the plurality of servers 40 has been completed, the user device 20 integrates the fragments of the file into the file based on the log file in S507, and informs the file management system 30 of the completion of the file transfer in S508.

Fig. 7 illustrates an example of a log file. The log file of Fig. 7 has intended to receive fragments of 1000001 bytes through 50000000 bytes of the file of 10000000 bytes from a third server 40. However, it fails in transferring the file, resulting in transferring the file of up to 2000578 bytes. The file of the remaining bytes is received from another server 40 as "fragment 6". The user device 20 integrates the fragments of the file into the original file based on the transmission information of the log file.

After completion of the file transfer, when the transferred file is stored as its specific file ID in the user device 20, the file management system 30 memorizes that the user device 20 stores the file having the file ID. In the case that it is impossible to ensure the identity of the transferred file due to the modification, location shift, and damage of the file by a user, the file can be deleted or excluded from a file share environment.

The step S506 of Fig. 5 of transferring fragments of a file in accordance with the present invention will now be described in detail.

The user device 20 evaluates a transfer rate whenever it receives packets of a certain size from each server, thus utilizing the transfer rate in transfer management. The transfer rate of the server is not constant, but continues to change. Thus, if there is a server of which transfer rate is sharply decreased during the transfer of file fragments, or of which transfer is unstable, another server must substitutes another server.

In order to replace the transmission server, the list of candidate servers as

shown in Fig. 6 is used. Another server having a relatively high transfer rate is determined from the list of candidate servers, and then the remaining part that the server having a problem has not transmitted yet is transmitted. The number of servers relacing the failing server can be more than one.

If there is no substitute server in the list of candidate servers, the user device 20 obtains the updated list of candidate servers from the file management system by request, and searches for a substitute server in this list.

Next, a method for ensuring that fragments of a file transmitted by a server is fragments of the same file will now be described.

As described above, in order to transfer files divided from a single file by a plurality of devices, it has to be ensured that all the devices transfer fragments of the same file. If the plurality of devices transfers fragments of different files, and the user device integrates these fragments into one file, this file may be not a user-desired file, but a damaged file.

To ensure the identity of the file, in the present invention, the information of the original file is recorded on a metafile upon transferring a file, and the information on the file to be transferred is compared with the information stored in the metafile upon transferring fragments of the file to another user. As the result of the comparison, if the file is the same as the original file, it is transferred, or if not, it is managed as a new file by receiving a new ID from the file management system. Whether or not the file is the same as the original file can be judged by the following method.

First, if the size of the file is identical to that of the original file, it is judged that they are identical.

Second, the file is segmented into an m-number of fragments, and thereafter the information on a certain part of each fragment is recorded on the metafile. When the file

is transferred to another device, the information on a certain part of the fragment to be transferred is compared with the information recorded on the metafile, it is judged that they are identical. At this time, the location and size of the certain part can be adjusted according to the need of the file management system.

Third, the file is segmented into an m-number of fragments, and thereafter all the contents of each fragment are encoded (message digest) to be recorded on the metafile. When the file is transferred to another device later, the fragment to be transferred is encoded, and then is compared with the code recorded on the metafile. If the codes are different, it is judged that the file is not identical to the original file. Accordingly, the fragment is not transferred, and is managed as a new file in the entire system.

If the comparison is performed after recording all the contents of the fragment on the metafile, it is possible to ensure the identity of the file a hundred percent. However, in this case, the size of the metafile is made identical to that of the original file, thus resulting in wasteful use of resources. Accordingly, the contents of the transferred fragment are converted into a code of a proper size, and then are recorded on the metafile.

The method for encoding fragments of a file will be represented by the following expression.

$$code_i = f(x_i)$$

f: encoding function

x_i: contents of i-th fragment

The encoding function and the size of the code are properly selected by the file

management system according to its purpose. As the simplest encoding function, a function for obtaining the sum of the contents will be a good example. In case of laying a special emphasis on ensuring the identity, a compression method having no loss of the contents at all can be used as an encoding function.

Fig. 8 is a view illustrating the phase in which a user device receives fragments of a file from a plurality of servers and integrates them into one file by the process as shown in Fig. 5.

In Fig. 8, five servers 81 through 85 each transfer fragments of a file to the user device 20. In this case, the server having a high transfer rate transfers a larger amount thereof. In Fig. 8, the server 83 transferring the largest amount has the highest rate, while the server 81 transmitting the smallest amount has the lowest rate.

In this way, by transferring a file by means of the five servers 81 through 85 in collaboration with one another, the user device 20 can make the best use of its bandwidth, thereby drastically enhancing the file transfer rate.

While the invention has been shown and described with reference to the method for receiving files divided from a single, complete file by a plurality of servers, it will be also adapted to the case where a file is split and stored into a plurality of devices. Therefore, the method and system for collaborating in transferring a file in accordance with the present invention can be used as a method for splitting and storing a file of a large capacity. Hereinafter, the description thereof will be explained.

With the increase of the size of a file, there may exist a device that cannot store the entire file. In this case, the device (referred to as device A) that cannot store the entire file stores a fragment of the file of a large capacity, and other devices store the remaining part. And, if device A wants to see the contents of the file of the large capacity, it can see the contents of the file as if the device A itself stored the entire file,

by receiving other fragments of the file using a file management system in accordance with the present invention. At this time, the fragments of the file split and stored into a plurality of devices are treated as a general file, respectively. The process of transmitting a file is also the same as the transmission process as described in Fig. 5.

For example, if device A cannot store a certain file of a large capacity completely, and thus splits this file into ten fragments of a size which is easy to handle for storing into a plurality of devices including device A itself, it can see the entire file by receiving the remaining part of the file that is not stored by itself by using the file management system in accordance with the present invention. The file system recognizes those ten fragments as ten general files, and transmits them to device A as shown in Fig. 5.

At this time, the file share system can manage these ten separate files as continuous fragments of a file. In addition, device A using the entire file stores a fragment of the file, particularly, it is effective to store the fragments that other devices have a less amount thereof. For this purpose, device A requests the file management system a list of candidate servers as shown in Fig. 6 with regard to those ten files, finds the number of servers owning each fragment of the file, and stores the fragment of the file which is owned by a smallest number of servers.

So far, the method for receiving fragments of a file from a plurality of servers and integrating them into a single file (many-to-one transmission) has been described on the assumption that the same file is split and stored into a plurality of servers.

However, when a file is generated at the very first time, this file exists in only one device. Accordingly, two methods for enhancing a transfer rate in case of transmitting a file to a plurality of devices (one-to-many transmission) will be described hereinafter.

Firstly, the former method relates to the case where a central control file management system as shown in Fig. 2 manages the rate of devices, which enables the devices to receive a file in order of their transfer rate.

In other words, the file management system obtains the transfer rate of the devices to receive a file, and aligns them in order of transfer rate, and sends a list of the devices to the device (server) storing the file and to a plurality of devices to receive the file. Referring to this list, the server transmits the file to the fastest device, the fastest device transmitting the file to the secondly fast device, the secondly fast device transmitting the file to the thirdly fast device. During the transmission, when the fastest device completes a transmission of the file, it informs the server of a transmission end message. Then the fastest device is allowed to serve as another server, and the device, which was the original server, is allowed to transmit the file to the secondly fast device.

The above method will now be described by way of an example with reference to Fig. 9. Suppose that an only device No.0 currently has a specific file, and devices No.1 through No. 100 aligned in order of transfer rate receive this file from the device No.0. The relay from the device No. 0 up to the device No.100 is performed in such a manner that the device No.0 transmits the file to the device No.1, the device No.1 transmits the file to the device No.2, and the like. When a file transfer to the device No. 1 is completed during transmission, the device No. 1 is allowed to serve as a server and the device No. 0, the original server, is allowed to transmit the file to the device No. 2 as well. In this way, as the number of servers continues to increase, this transmission gradually becomes a many-to-one transmission, thereby enhancing the transfer rate of the file.

Secondly, the latter method relates to a method in which the file management system does not have to manage the rate of the devices. If the number of devices

requesting the device acting as a server (device No.0) to carry out a file transmission becomes larger than a predetermined capacity, the device No.0 concentrates its file transmission upon the device having the highest rate (device No.1), and scarcely transmits a file to the other devices, thus inducing the other devices to search for another server. Meanwhile, the device 0 informs the file management system that the device No.1 currently carrying out a transmission will be the device to serve as a new server.

When the other devices request for the list of devices acting as a server, the file management system sends a list containing the device No.1. Upon seeing this list, the other devices try to receive a file from the device No.1.

Accordingly, the device No.1 transmits a file to the other devices within the scope of data received up to the present, and at the same time receives a file from the device No.0. If there are too many devices requesting the device No.1 to carry out a file transmission, the file management system is informed that the device (device No.2) to which the device No.1 is transmitting a file is a device to serve as a new server. In this way, the one-to-many transmission is gradually changed into a many-to-one transmission, thereby enhancing a transfer rate.

While the invention has been so far described with reference to the case of downloading a file, it can also be adapted to a streaming transmission. The streaming is a technology of reproducing video or audio contents while receiving data without a need to download a file of a large capacity in order to view the video or audio contents. In this case, also, the present invention can be directly adapted as in the case of downloading a file.

While the invention has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the

spirit and scope of the invention as defined by the appended claims.

The file transfer system and method in accordance with the present invention sharply enhances a file transfer rate, not by transmitting the entire file to users only by means of a single server, but by receiving files divided from a single file by a plurality of servers.

In addition, when any problem occurs in one of the servers during transmission of a file, another server substitutes for submission of the file with fault tolerance of a server.

In addition, even if a file exists in a single device, and it has to be transmitted from the single device to a plurality of devices, the transfer rate of the file can be enhanced.

The file transfer system and method in accordance with the present invention can be used for utilizing a file of a large capacity that is difficult to use in the prior art, and also can be used for streaming services.

What Is Claimed Is:

1. A method for transferring a file among a plurality of devices connected via a network, comprising the steps of:

selecting a desired file to be received by a user device;

receiving information on the devices storing the file from a file management system that manages transmission of files;

determining one or more servers, through which the file is to be transmitted, among the devices storing the file;

requesting one or more servers to transmit a fragment of the file, respectively;

receiving the requested fragments of the file from the one or more server, respectively; and

integrating the fragments of the transmitted file into a single file.

2. The method of claim 1, wherein one or more servers are selected from the devices storing the file in order of the transfer rate of the devices..

3. The method of claim 1, wherein, upon requesting the one or more servers a fragment of the file, the higher the transfer rate of a server becomes, the larger the size of the requested fragment of the file becomes.

4. The method of claim 1, wherein, in the case that the requested fragment of the file is transmitted from the one or more servers, respectively, the information on the transmitted fragment is recorded on a log file.

5. The method of claim 4, wherein the user's device refers to the log file when integrating the fragments of the transmitted file into a single file.

6. The method of claim 1, wherein the file transfer method further comprises the step of informing the file management system of the completion of the file transfer after the step of integrating the fragments of the file into a single file.

7. The method of claim 1, wherein, in the step of receiving the requested fragments of the file from the one or more servers, the transfer rate of each server is checked whenever receiving packets of a certain size.

8. The method of claim 7, wherein, if there exists a server having a transfer rate smaller than a predetermined value, another server substitutes the failing server.

9. The method of claim 8, wherein, if there is no substitute server, the information on the devices storing the file and the transfer rate of the devices are received again, and the substitute server is determined from this information.

10. The method of claim 1, wherein the device represents a device available for data communication, such as a personal computer, workstation, minicomputer, mainframe computer, notebook computer, PDA(personal digital assistant), etc.

11. The method of claim 1, wherein the network represents a networking-

enabled environment, such as a wired internet, wireless internet, LAN(local area network), intranet, and extranet.

12. The method of claim 12, wherein the desired file to be received has a common file ID in the devices storing the file.

13. The method of claim 1, wherein the file management system is one of the devices connected via the network.

14. The method of claim 1, wherein the file management system is split into the devices connected via the network.

15. The method of claim 1, wherein the information on the devices storing the file comprises the ID, location, and transfer rate of the devices.

16. The method of claim 1, wherein the file transfer method further comprises the step in which the user's device stores the information on the integrated file in the metafile.

17. The method of claim 16, wherein, when the integrated file is transmitted again to other devices, it is checked if the information on the file is identical to the information recorded on the metafile.

18. The method of claim 1, wherein the transmission comprises downloading and streaming technologies.

19. In a case where a single file is split and stored into a plurality of devices connected via a network, a method for calling the file, comprising the steps of:

receiving information on the devices storing fragments of the file from a file management system that manages transmission of files;

determining one or more servers, through which the file is to be transmitted, among the devices storing the fragments of the file;

receiving the fragments of the file from the determined one or more servers; and

integrating the fragments of the transmitted file into a single file.

20. The method of claim 19, wherein the fragments of the file belong to the same file.

21. A method for transferring a file from one device to a plurality of devices among devices connected via a network, comprising the steps in which:

the one device transfers the file to the fastest device of the plurality of devices; and

the file is transferred down to the slowest device in such a manner that the fastest device having received the file transfers the file to the secondly fast device of the plurality of devices, and the secondly fast device having received the file transfers the file to the thirdly fast device, and

in which if the one device finishes file transfer to one of the plurality of devices, the file is transferred to another device of the plurality of devices.

22. A method for transferring a file from one device to a plurality of devices among devices connected via a network, comprising the steps in which:

the one device transfers the file to the plurality of devices; and

if the amount of transmission exceeds a predetermined level, the one device transfers the file only to the fastest device of the plurality of devices, the fastest device receiving the file from the one device, simultaneously transferring the file to other devices of the plurality of devices.

23. The method of claim 21 or 22, wherein the transmission comprises downloading and streaming technologies.

24. A method for transferring the same file as a requested file, comprising the steps of:

segmenting the file into predetermined fragments, and storing the information of a part of each fragment;

segmenting the file into predetermined fragments to extract the information on the part of each fragment in response to the transmission request for the file;

comparing the extracted information with the information stored in the metafile; and

if they are identical as the result of the comparison, the file is transmitted, or if not identical, a specific file ID is given to the file.

25. A method for transferring the same file as the requested file, comprising the steps of:

a) segmenting the file into predetermined fragments, encoding each fragment

by an encoding function, and storing each code in the metal file;

b) segmenting the file into predetermined fragments and encoding each of the fragments into an encoding function in response to the transmission request for the file;

c) the result encoded in the step b) is compared with the information recorded on the meta file;

d) if they are identical as the result of the comparison, the file is transmitted, or if not identical, a specific file ID is given to the file.

Fig 1

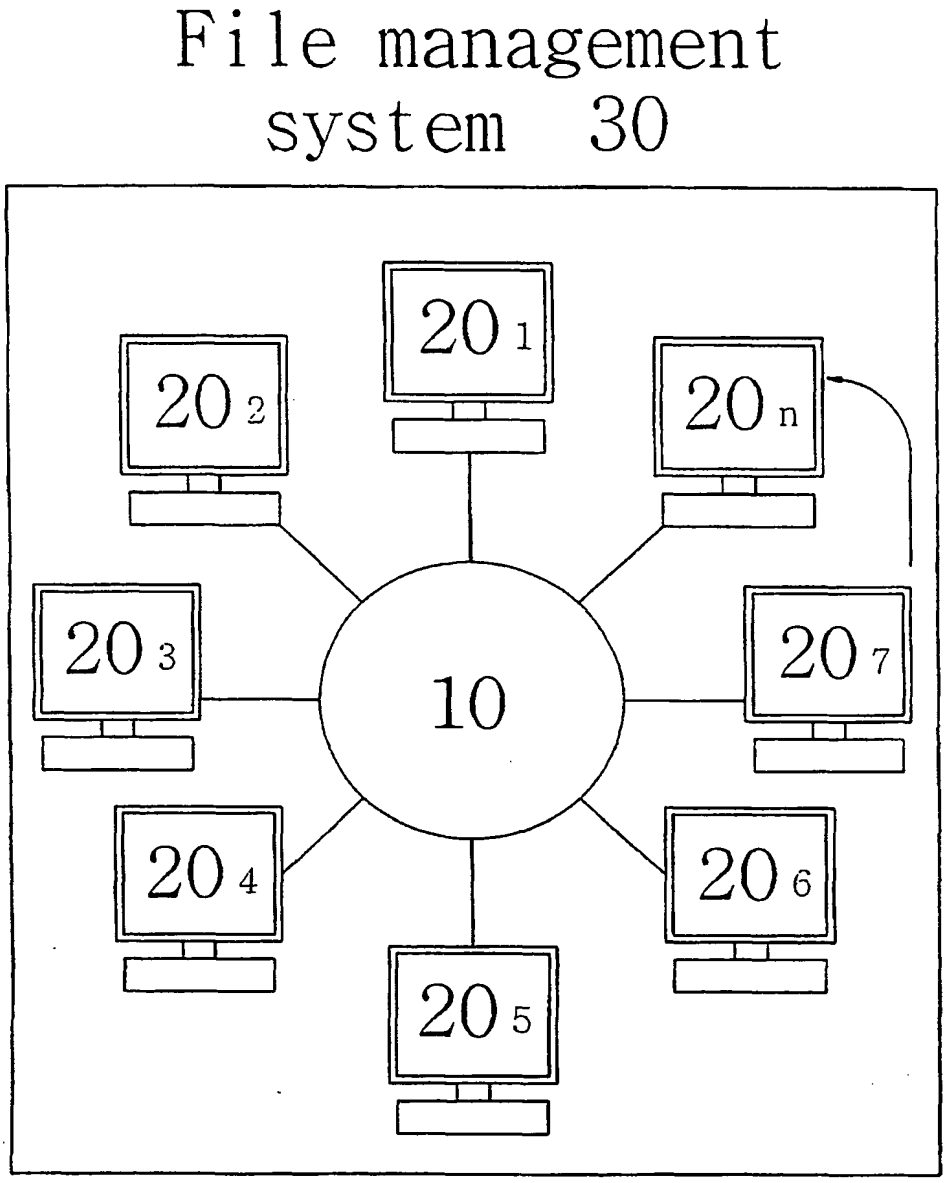


Fig 2

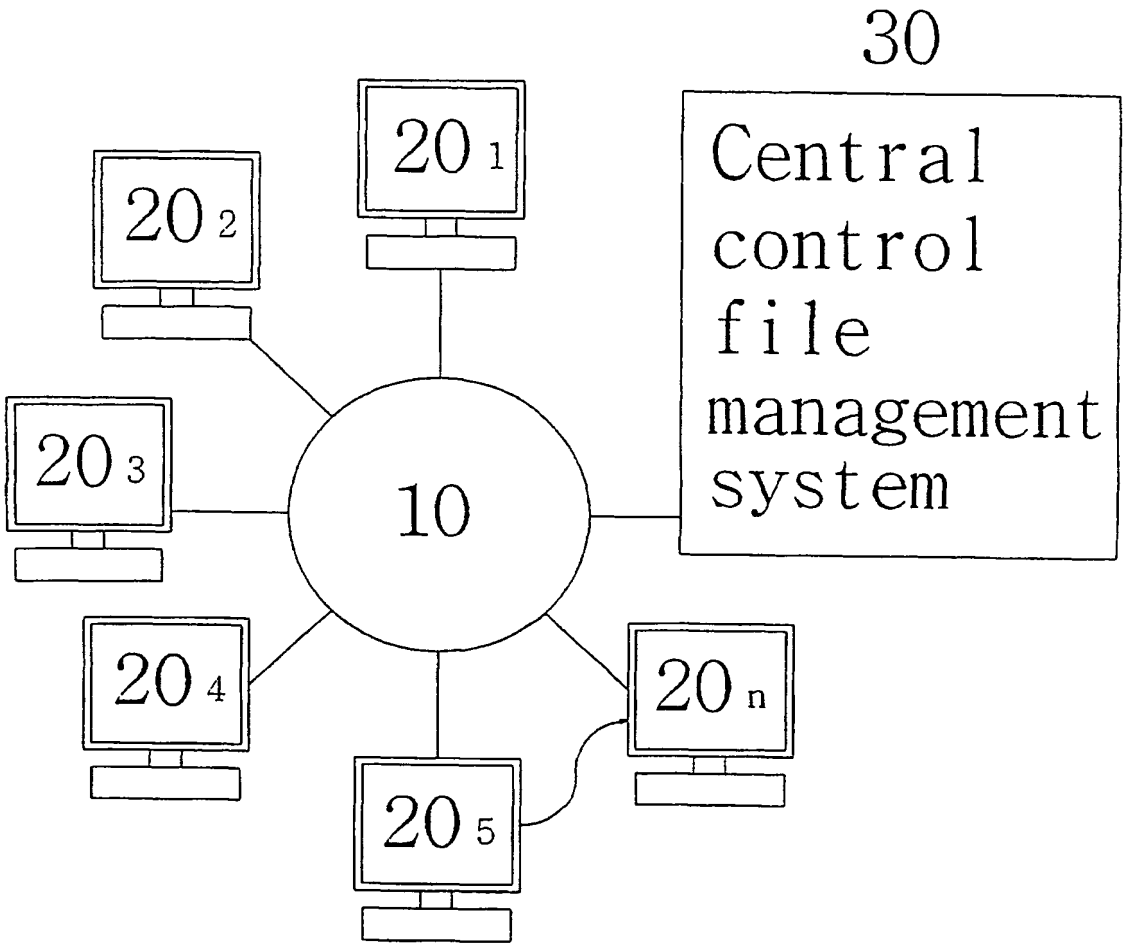

30
Central control file management system
10
20 1
20 2
20 3
20 4
20 5
20 n

Fig 3

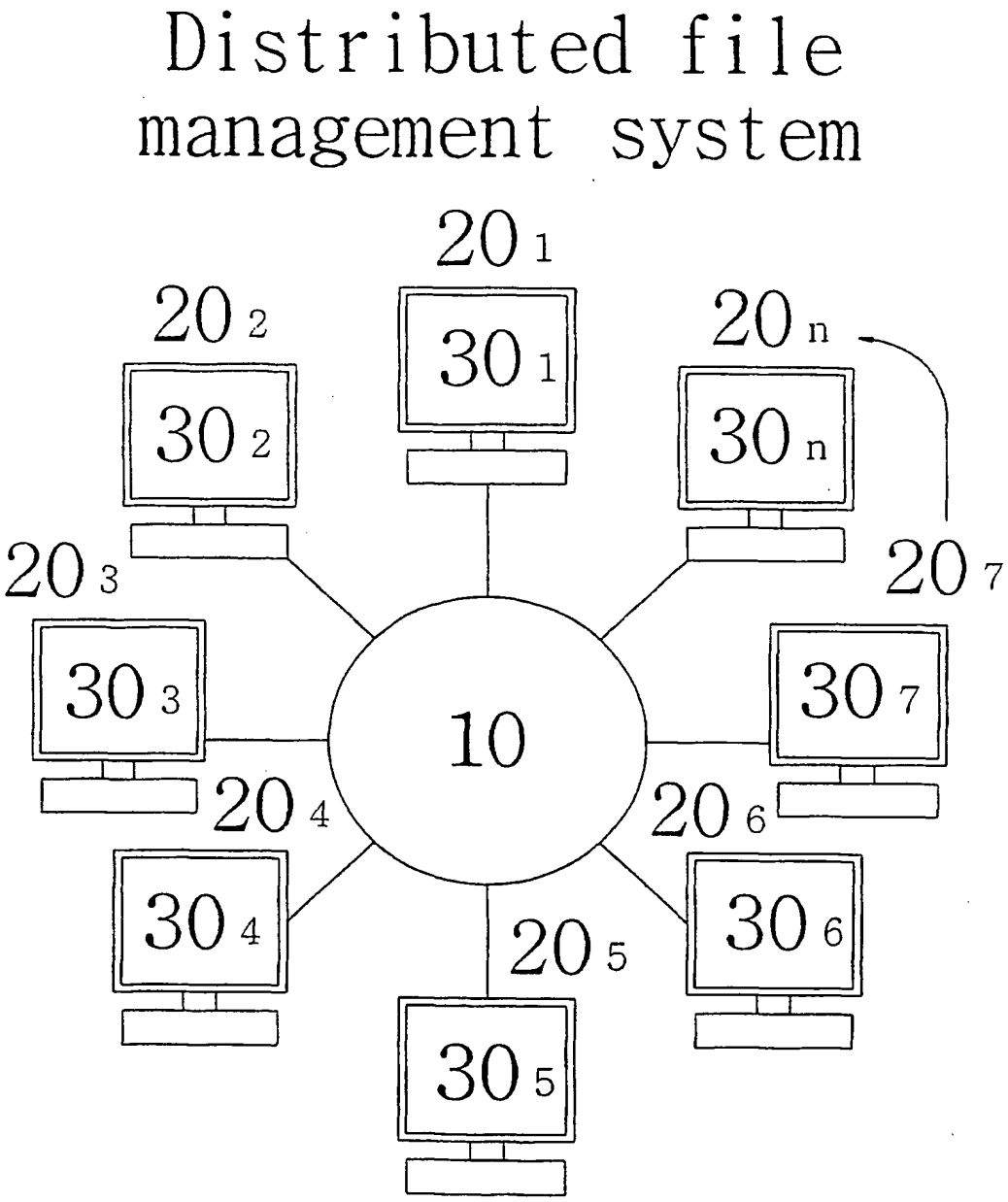

Distributed file management system
20 1
20 2
20 n
30 1
30 2
30 n
20 3
20 7
30 3
30 7
10
20 4
20 6
30 4
30 6
20 5
30 5

Fig 4

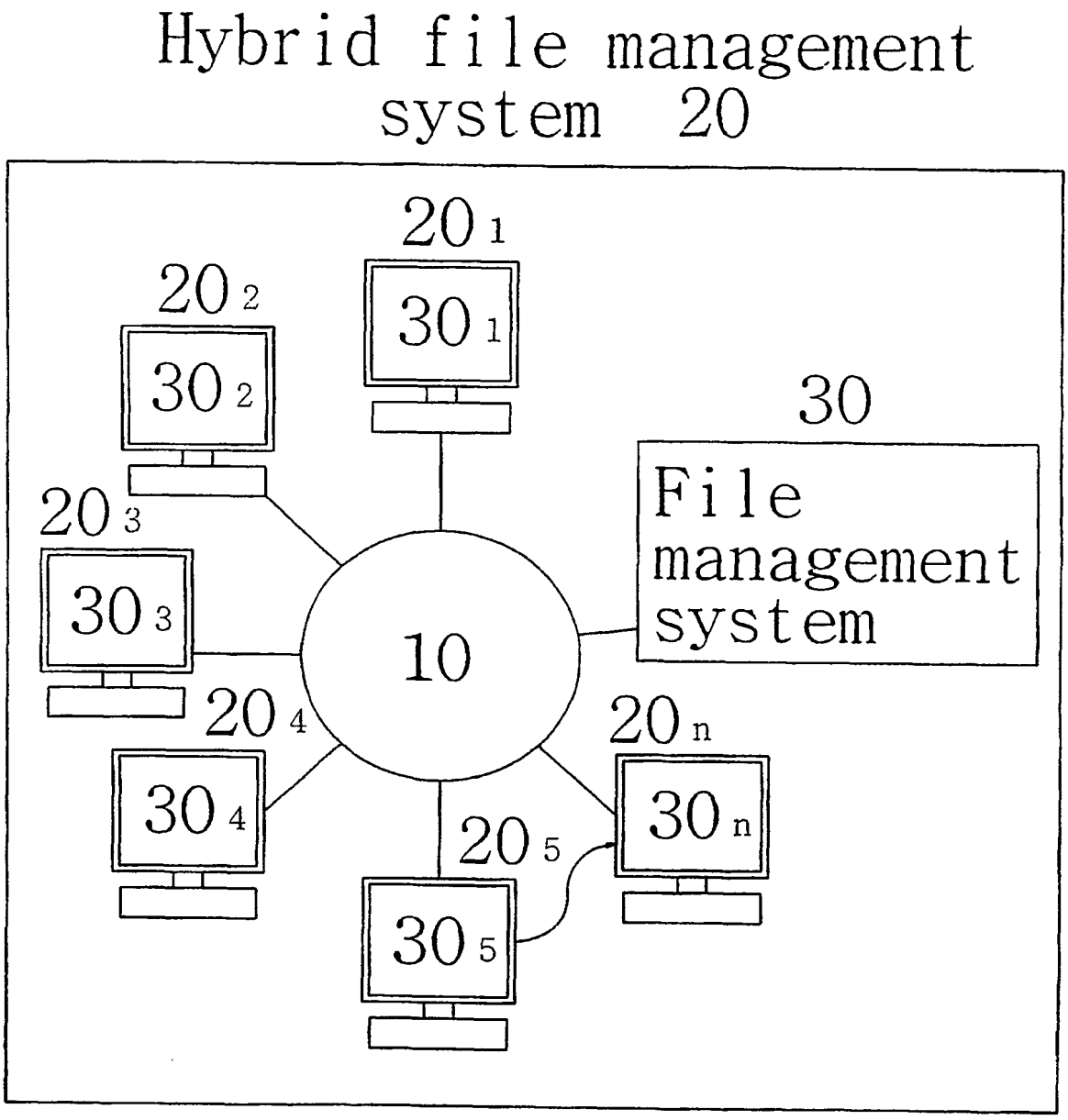

Hybrid file management system 20
20 1
30 1
20 2
30 2
30
File management system
20 3
30 3
10
20 4
30 4
20 n
30 n
20 5
30 5

Fig 5

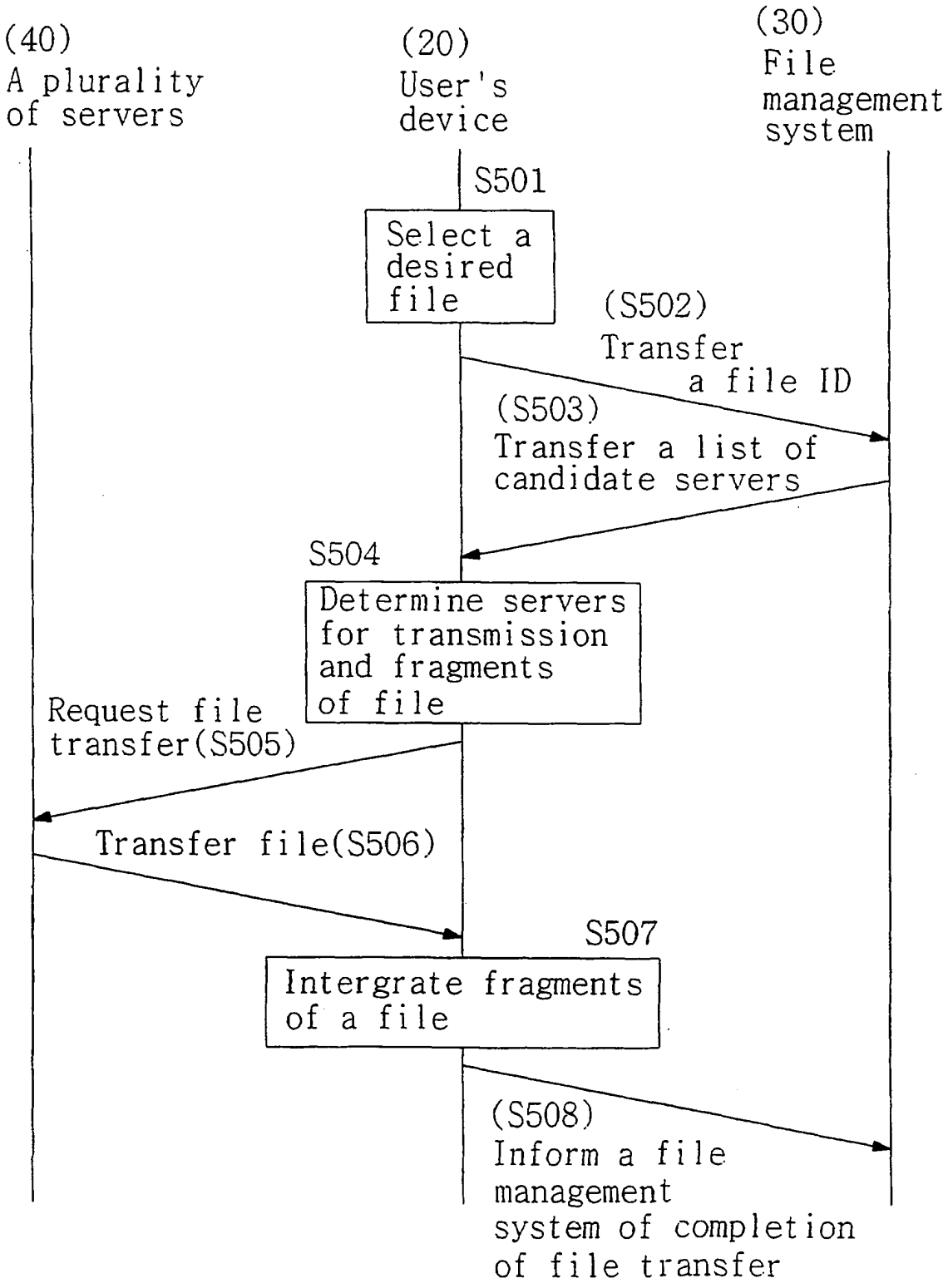

(40)
A plurality of servers
(20)
User's device
(30)
File management system
S501
Select a desired file
(S502)
Transfer a file ID
(S503)
Transfer a list of candidate servers
S504
Determine servers for transmission and fragments of file
Request file transfer(S505)
Transfer file(S506)
S507
Intergrate fragments of a file
(S508)
Inform a file management system of completion of file transfer

Fig 6

(601) Server ID	(602) Location	(603) Transfer rate
S_1	L_1	V_1
S_2	L_2	V_2
S_3	L_3	V_3
S_4	L_4	V_4
S_5	L_5	V_5
⋮	⋮	⋮
S_n	L_n	V_n

Fig 7

Overall size
of a file : 10000000

Fragment 1 : 1-1000
Fragment 2 : 1001-1000000
Fragment 3 : 1000001-2000578
Fragment 4 : 5000001-8000000
Fragment 5 : 8000001-10000000
Fragment 6 : 2000579-5000000

Fig 8

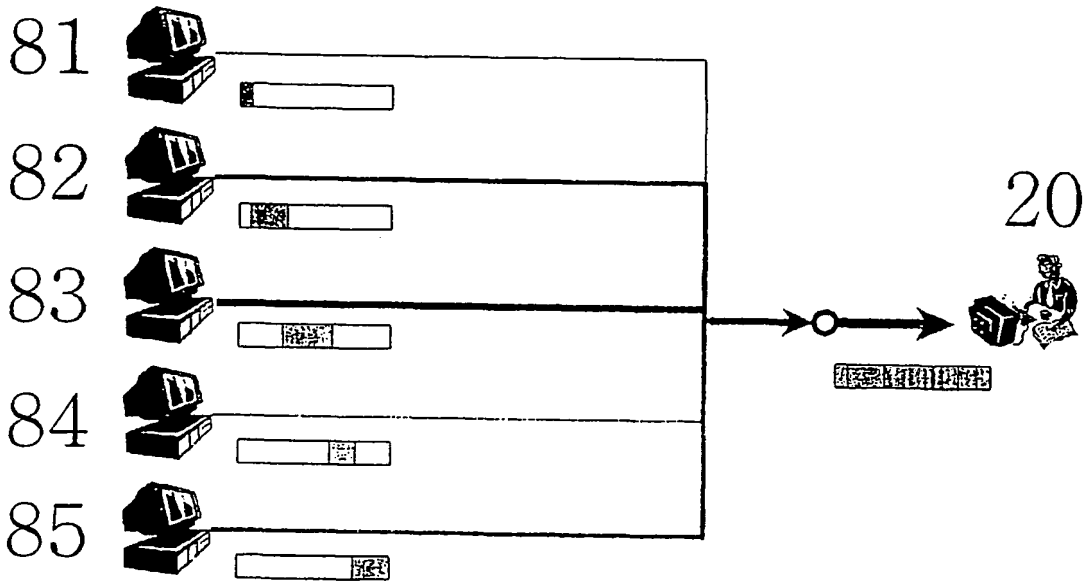
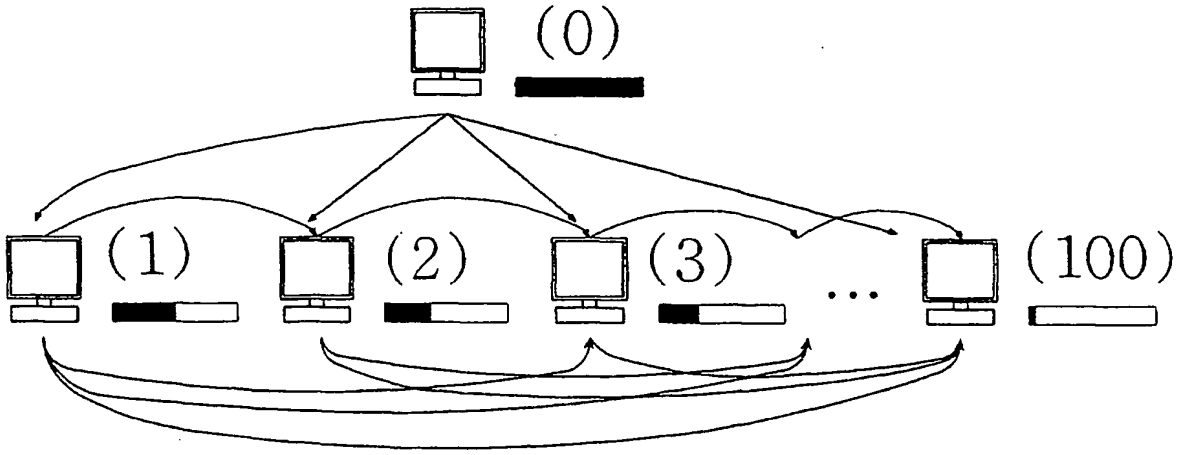


Fig 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR01/00499

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 H04L 12/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimun documentation searched (classification system followed by classification symbols)
IPC7 H04L 12/56

Documentation searched other than minimun documentation to the extent that such documents are included in the fileds searched
Korean patents and applications for inventions since 1975
Korean utility models and applications for utility models since 1975

Electronic data base consulted during the intertnational search (name of data base and, where practicable, search trerms used)
http://ep.sepacenet.com(Worldwide search in the European Patent Offfice), "Transfer Divided File"
IEEE/IEE Electronic library(since 1988), "Transfer and Divided and File"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 9642145 A (SALOMAEKI ARI) 27 December 1996 (27.12.1996)	1-25
Y	WO 9713337 A (SALOMAEKI ARI) 10 April 1997 (10.04.1997)	1-25
Y	WO 9728620 A (SALOMAEKI ARI) 7 August 1997 (07.08.1997)	1-25
Y	Determining the optical file size on tertiary storage systems based on the distribution of query sizes Bernardo, L.M.; Nordberg, H.; Rotem, D.; Shoshani, A. Scientific and Statistical Database Management, 1998. Proceedings. Tenth International Conference on Published: 1998, Page(s): 22-31	1-25
Y	Performance analysis of an integrated video/data transport mechanism with built-in congestion control Ting-Chao Hou; Lucantoni, D. M. Global Telecommunications Conference, 1988, and Exhibition. 'Communications for the Information Age'. Conference Record, GLOBECOM 'SS., IEEE Published: 1988, Page(s): 231-238 vol.1	1-25

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"Y" document of particular relevence; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 APRIL 2001 (27.04.2001)	27 APRIL 2001 (27.04.2001)
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Taejon, Dunsan-dong, So-ku, Taejon Metropolitan City 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer KIM, Beom Yong Telephone No. 82-42-481-5684

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